

# CAT8710

## Quad Voltage Supervisor

The CAT8710 is a space-saving, precision quad voltage supervisor, designed to monitor up to four supply voltages with a single device. When any supply voltage drops below its preset threshold, the CAT8710 will output a single reset to the threshold. One CAT8710 IC eliminates the need for multiple reset circuits, which minimizes system components and improves reliability.

The CAT8710 provides 2 factory preset thresholds for monitoring 3.3 V, 3.0 V, 2.5 V, and 1.8 V supplies within  $\pm 5\%$  and 2 user-selectable thresholds, adjustable down to 0.62 V with 2% accuracy. On power up, the reset remains low for 120 ms typical, after all voltages have risen above their selected thresholds. The output remains valid as long as VDD remains above 1 V.

The CAT8710 is available in a 6-pin SOT23 package and operates over the industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

### Features

- Monitors 4 Power-Supply Voltages Simultaneously
- 2 Factory Preset Reset Threshold Options for 3.3 V, 3.0 V, 2.5 V, and 1.8 V Supplies
- 2 User-Programmed Threshold Monitors, Adjustable Down to 0.62 V with 2% Accuracy
- Drop-in replacement to MAX6710
- Low Supply Current: 3  $\mu\text{A}$  (typ)
- Ultra Low Power vs. Maxim
- Reset Timeout Period: 120 ms (typ)
- $\overline{\text{RESET}}$  Valid to  $V_{\text{CC}} = 1\text{ V}$
- Immune to Short Supply Transients
- Temperature Range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Small, SOT23 6-Pin Package
- This Device is Pb-Free, Halogen Free/BFR Free and RoHS Compliant

### Applications

- Monitoring of Multiple Power Supply Voltages

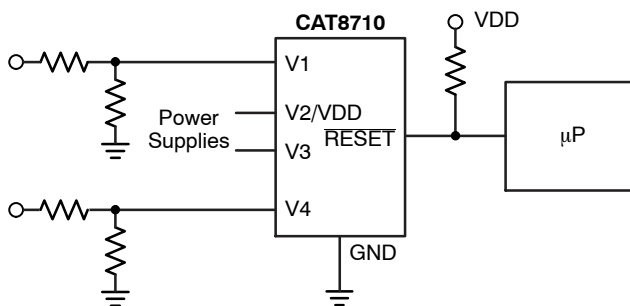


Figure 1. Typical Application Circuit



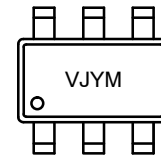
ON Semiconductor®

<http://onsemi.com>



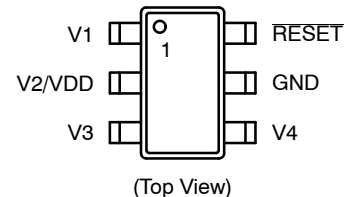
SOT23-6  
TD SUFFIX  
CASE 527AJ

### MARKING DIAGRAM



VJ = Specific Device Code  
Y = Production Year (last digit)  
M = Production Month: 1-9, A, B, C

### PIN CONNECTIONS



(Top View)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# CAT8710

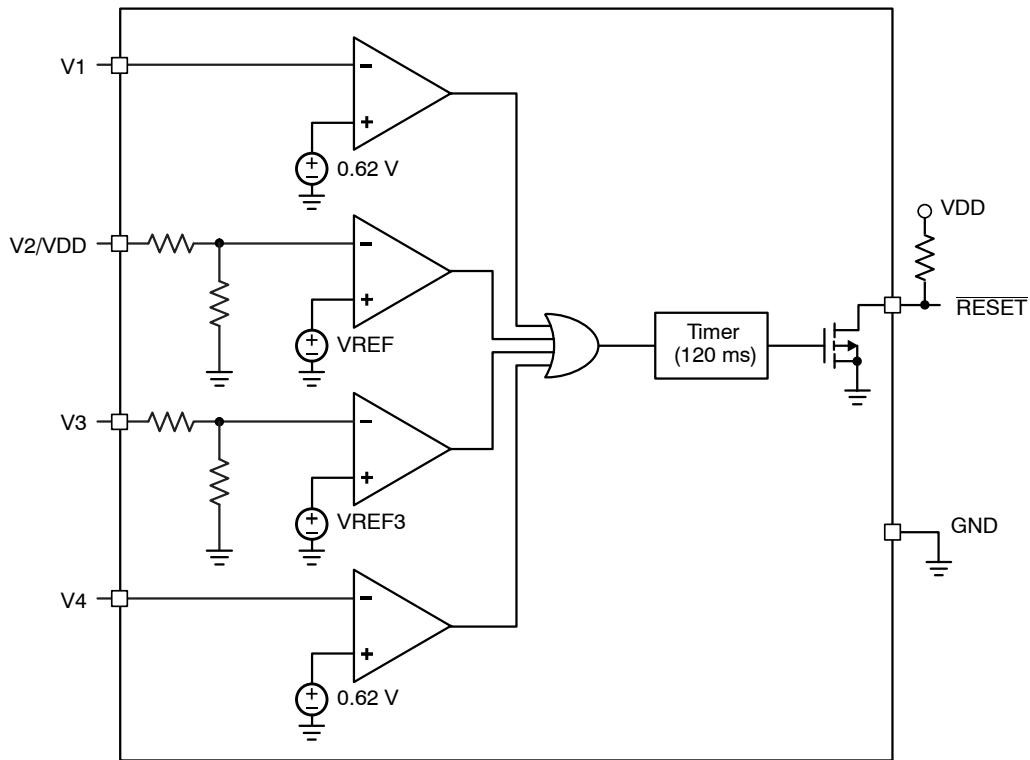


Figure 2. CAT8710 Block Diagram

Table 1. PIN FUNCTION

Pin Name	Function
V1	Adjustable under-voltage detector input.
V2/VDD	First preset under-voltage detector input and power for internal circuitry.
V3	Second preset under-voltage detector input.
V4	Adjustable under-voltage detector input.
GND	Ground
RESET	Open Drain active LOW reset output

Table 2. ORDERING INFORMATION

Part Number	Nominal Input Voltage [V]				Supply Tolerance	Package	T&R Quantity
	V1	V2/VDD	V3	V4			
CAT8710FTD-GT3	Adj	3.3	2.5	1.8	5%	SOT-23-6	3,000
CAT8710JTD-GT3 (Note 1)		3.3	2.5	Adj			
CAT8710LTD-GT3 (Note 1)		3.3	1.8	Adj			
CAT8710NTD-GT3 (Note 1)		3.0	2.5	Adj			
CAT8710PTD-GT3 (Note 1)		3.0	1.8	Adj			

1. Consult factory for availability.

# CAT8710

**Table 3. ABSOLUTE MAXIMUM RATINGS**

Rating	Value	Unit
$V_{DD}$ , $V_x$ , $\overline{\text{RESET}}$ to GND	-0.3 to +6.0	V
Continuous $\overline{\text{RESET}}$ Current	20	mA
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-65 to +150	°C
Junction Temperature	+150	°C
Lead Temperature (soldering, 10 s)	+300	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Table 4. ELECTRICAL CHARACTERISTICS**

( $V_{DD} = 1.0\text{ V}$  to  $5.5\text{ V}$ ,  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ , unless otherwise noted. Typical values are at  $V_{DD} = 3.0\text{ V}$  to  $3.3\text{ V}$ ,  $T_A = +25^\circ\text{C}$ .) (Note 2)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{DD}$	Operating Voltage		1.5		5.5	V
$I_{DD}$	Supply Current	$V_{DD} = 5\text{ V}$		3	9	$\mu\text{A}$
$I_{DD3}$		$V_{DD3} = 3.3\text{ V}$		0.5	3	$\mu\text{A}$
$I_{ADJ}$	Leakage Current, V1, V4	$V_{ADJ} = 1.0\text{ V}$		15	50	nA
$V_{IN}$	Input Voltage Threshold on V2/VDD and V3	$3.3\text{ V} = V_{DD}$	3.00	3.08	3.15	V
		$3.0\text{ V} = V_{DD}$	2.70	2.78	2.85	
		$2.5\text{ V} = V_{DD}$	2.25	2.32	2.38	
		$1.8\text{ V} = V_{DD}$	1.62	1.67	1.71	
$V_{TH}$	Adjustable Threshold	Monitored voltage decreasing	0.611	0.620	0.629	V
$V_{HYST}$	Reset Threshold Hysteresis	Monitored voltage increasing compared to monitored voltage decreasing		0.3		$\%V_{TH}$
$TCV_{TH}$	Reset Threshold Temperature Coefficient			60		ppm/°C
$t_{RD}$	$V_{IN}$ to Reset Delay	$V_{IN}$ falling at $10\text{ mV}/\mu\text{s}$ from $V_{TH}$ to ( $V_{TH} - 50\text{ mV}$ )	1	6		$\mu\text{s}$
$t_{RP}$	Reset Timeout Period	CAT8710	70	120	240	ms
$V_{OL}$	$\overline{\text{RESET}}$ Output Low	$V_{CC} \geq 5\text{ V}$ , $I_{SINK} = 2.5\text{ mA}$		0.05	0.4	V
		$V_{CC} < 3.3\text{ V}$ , $I_{SINK} = 1.5\text{ mA}$		0.05	0.4	

2. 100% production tested at  $T_A = +25^\circ\text{C}$ . Limits over temperature guaranteed by design.

3. The devices are powered from  $V_{DD}$ .

4. The  $\overline{\text{RESET}}$  output is guaranteed to be in the correct state for  $V_{DD}$  down to 1 V.

# CAT8710

## TYPICAL CHARACTERISTICS

( $V_{DD} = V_{CC} = 3.0\text{ V}$ ,  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

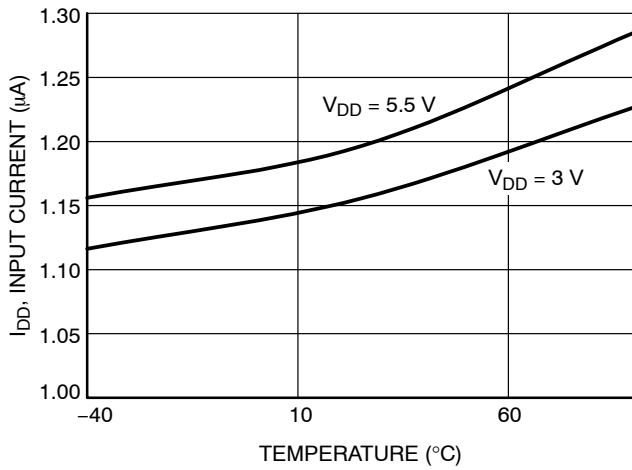


Figure 3.  $I_{DD}$  Input Current vs. Temperature

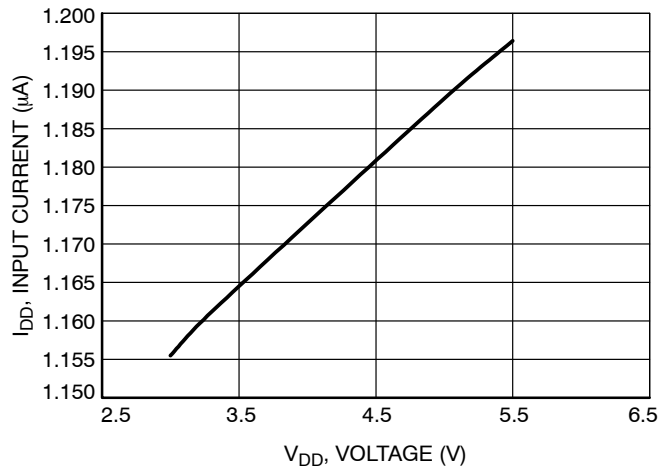


Figure 4.  $I_{DD}$  Input Current vs.  $V_{DD}$  Voltage

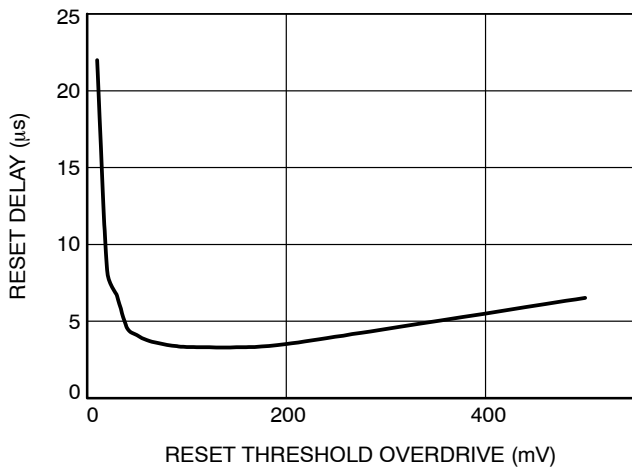


Figure 5.  $\overline{\text{RESET}}$  Delay vs. RESET Threshold Overdrive (As Monitored Voltage is Decreasing)

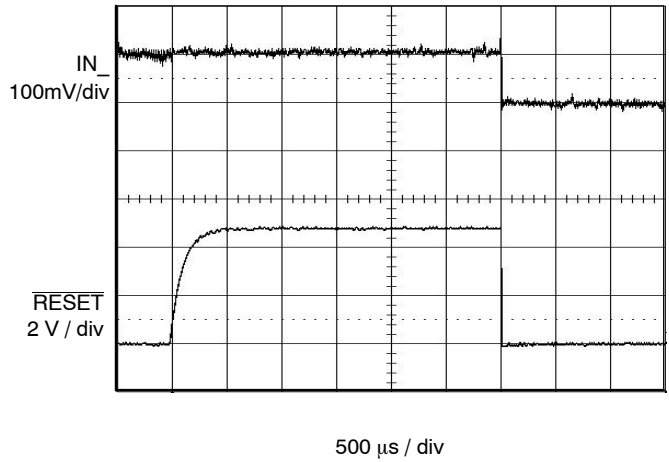


Figure 6.  $\overline{\text{RESET}}$  Pull-up and Pulldown Response ( $C_L = 47\text{ pF}$ ,  $R_L = 470\text{ k}\Omega$ )

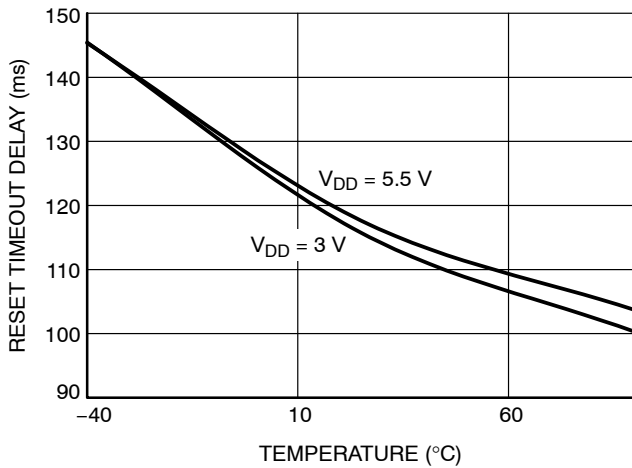


Figure 7.  $\overline{\text{RESET}}$  Timeout Delay vs. Temperature

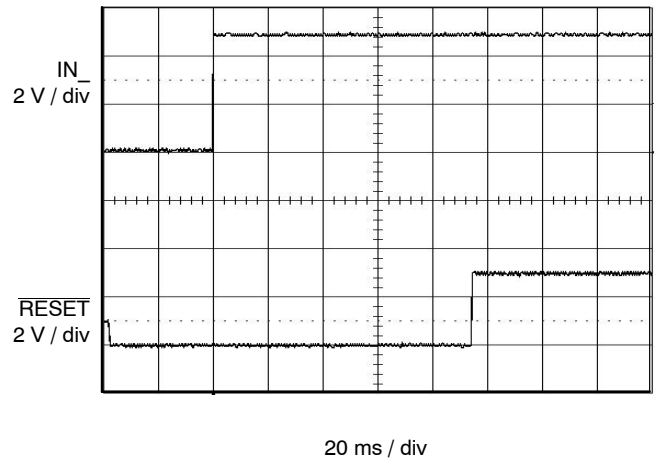


Figure 8.  $\overline{\text{RESET}}$  Timeout Delay

# CAT8710

## Detailed Description

The CAT8710 is a space-saving, low-power, quad voltage microprocessor supervisory circuit designed to monitor 4 voltage supplies. The CAT8710 has 2 factory preset thresholds for monitoring standard power supply voltages of 3.3 V, 3.0 V, 2.5 V, or 1.8 V, and 2 adjustable thresholds for monitoring voltages as low as 0.62 V.

Each internal voltage comparator has a typical hysteresis of 0.3% with respect to its reset threshold, which improves immunity to ambient noise without significantly reducing threshold accuracy. CAT8710 is designed to ignore short transients.

## Applications Information

### Reset Output

CAT8710 provides an extended reset signal 120 ms (typ) in duration. The output is open drain and requires an external pull-up resistor to an external power supply. This supply can be less than or greater than VDD, but should not exceed 5.5 V. When the external pull-up voltage is greater than VDD reverse current flow from the external pull-up voltage to VDD is prevented by CAT8710's internal circuitry.

The CAT8710 is powered by VDD, which is also a monitored voltage. When any supply drops below its threshold, the reset output asserts low and remains low as long as VDD is above 1.0 V.

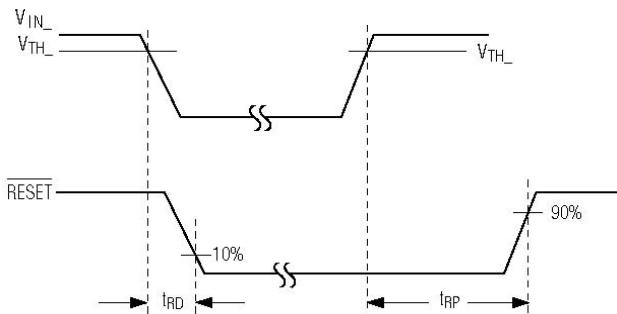


Figure 9.  $\overline{\text{RESET}}$  Output Timing Diagram

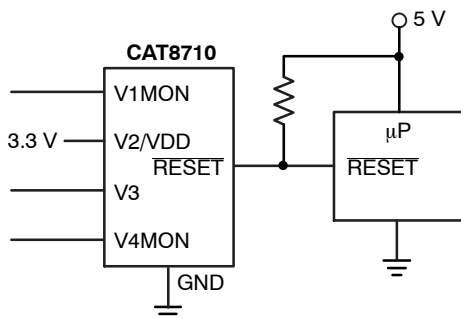


Figure 10. Interfacing to Different Logic-Supply Voltage

## Adjustable Thresholds

CAT8710 allows users to create 2 custom voltage thresholds. The threshold voltage at each adjustable input is typically 0.62 V. Monitoring of voltages greater than 0.62 V requires a resistor-divider network to be connected to the circuit (Figure 11).

$$V_{IN} = 0.62 \text{ V} \times \frac{(R1 + R2)}{R2}$$

or, written in terms of R1:

$$R1 = R2 \left( \frac{V_{IN}}{0.62 \text{ V}} - 1 \right)$$

Because the CAT8710 has a guaranteed input current of less than 50 nA on the adjustable inputs, resistor values up to 1000 kΩ can be used for R2 with < 1% error.

## Unused Inputs

Connect unused monitor inputs to a supply voltage greater in magnitude than their specified threshold voltages; use VDD for normal operation (device power-supply pin). Do not connect unused monitor inputs to ground or allow them to float.

## Adding Manual Reset Capability

Figure 12 illustrates how to add manual reset to the CAT8710. Depressing the pushbutton switch short-circuits the analog input to ground and initiates a  $\overline{\text{RESET}}$  pulse. This technique can be used on either the V1 or V4 inputs. The switch must be open for at least 120 ms in order to deassert the  $\overline{\text{RESET}}$  output. No external switch debounce is required. A small capacitor across R2 will improve noise immunity when using long leads from the pushbutton switch to the adjustable input.

## POR

Applying power to the CAT8710 activates a POR circuit which activates the reset output (active LOW). At power-up POR prevents the system microprocessor from starting to operate with insufficient voltage and prior to stabilization of the clock oscillator. It ensures that operation is precluded until internal registers are properly loaded, FPGA's have downloaded their configuration data. The reset signal remains active until all monitored power supplies have risen above their minimum preset voltage levels.

## Power-Supply Bypassing

All monitored inputs are immune to short supply transients. For applications where higher immunity is required, connect a 0.1 μF bypass capacitor from each input pin to ground very close to CAT8710's package.

# CAT8710

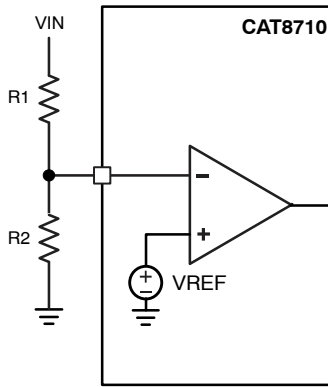


Figure 11. Setting the Auxiliary Monitor

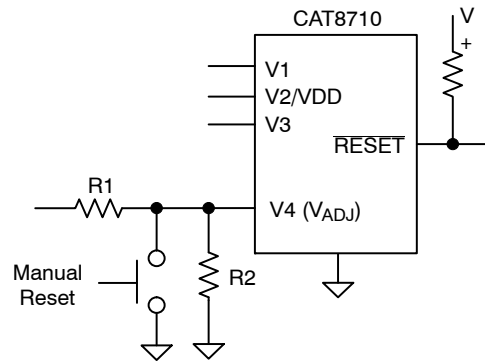
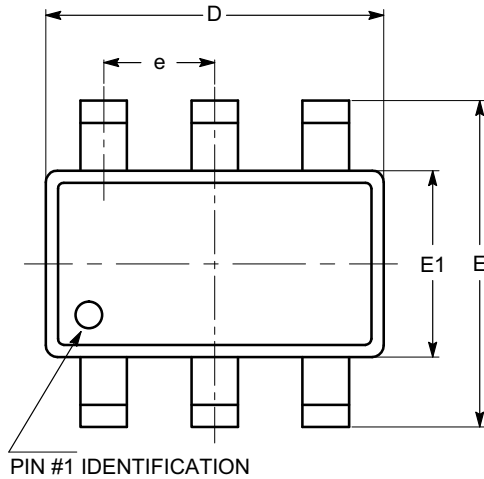


Figure 12. Adding Manual Reset Capability

# CAT8710

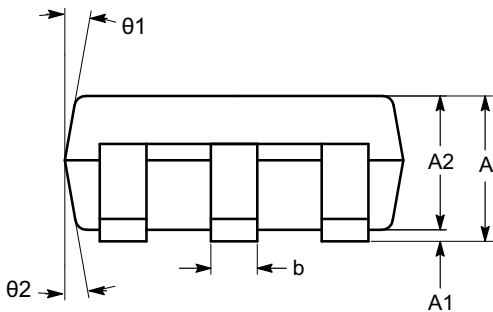
## PACKAGE DIMENSIONS

SOT-23, 6 Lead  
CASE 527AJ-01  
ISSUE O

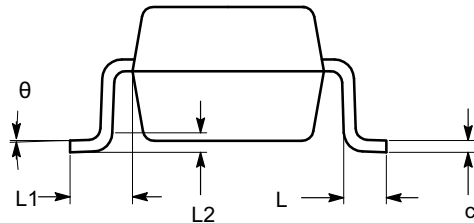


TOP VIEW

SYMBOL	MIN	NOM	MAX
A	0.90		1.45
A1	0.00		0.15
A2	0.90	1.15	1.30
b	0.30		0.50
c	0.08		0.22
D	2.90 BSC		
E	2.80 BSC		
E1	1.60 BSC		
e	0.95 BSC		
L	0.30	0.45	0.60
L1	0.60 REF		
L2	0.25 REF		
$\theta$	0°	4°	8°
$\theta 1$	5°	10°	15°
$\theta 2$	5°	10°	15°




SIDE VIEW



END VIEW

**Notes:**

- (1) All dimensions in millimeters. Angles in degrees.
- (2) Complies with JEDEC standard MO-178.

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

**PUBLICATION ORDERING INFORMATION**

**LITERATURE FULFILLMENT:**  
Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** orderlit@onsemi.com

**N. American Technical Support:** 800-282-9855 Toll Free USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5773-3850

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative